# Occupational Health and Safety Issues among Vegetable Farmers in Trinidad and the Implications for Extension

K. S. Baksh, W. Ganpat, L. K. Narine

**ABSTRACT.** *Trinidad has an aged farming population. For a host of reasons, young persons are not entering the agricultural sector; therefore, these aged farmers will continue to be the backbone of the industry. Hence, there is much need for improving the health and safety of the workers within this sector. This first-time study assessed the prevalence of occupational health and safety disorders and discomforts among Trinidad's vegetable farmers in an attempt to understand the extent of the problem within the general farm population. The implications for extension are highlighted, and several recommendations are provided. Small-scale commercial-oriented vegetable farmers (n = 100) from ten of the most populated agricultural areas across Trinidad were surveyed. Results indicated that there was an overall moderate prevalence of occupational injuries among vegetable farmers. Most prevalent were musculoskeletal disorders of the lower back and upper body extremities, watery/burning eyes, skin rashes/itching, headaches, fatigue, dehydration, stress, and injuries attributed to slips and falls. Based on the evidence that a problem exists with health and safety, the extension service can now prepare and deliver programs to educate farmers on the actions necessary to improve their personal health and safety and that of their workers. This type of study has not been done before among farmers in Trinidad. It brings a very important and timely issue to the fore because of the aged farming population. Additionally, since the farmer profile and farming systems are similar in the wider Caribbean, policy makers can take note of the findings and recommendations and embrace actions.*

***Keywords.*** *Agriculture, Analysis of variance, Extension services, Occupational health and safety, Trinidad, Vegetable farmers.*

Occupational health and safety (OHS) addresses a broad range of health and safety issues, such as those attributed to workplace hazards, through programs, policies, and practices. OHS is considered to be the joint responsibility of workers, employers, and governments since it is important from moral, economic, and legal perspectives. Therefore, OHS has become a major worldwide concern across various industrial sectors, including agriculture.

The job of a farmer is difficult, especially in developing countries such as Trinidad, where many agricultural activities are still performed manually. Farming is also associated with exposure to a wide range of hazards, all of which can have undesirable conse-

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quences, such as infections by pathogens, injuries from exposure, poisonings, physiological disorders, respiratory tract infections, and musculoskeletal disorders. According to the Centers for Disease Control and Prevention (CDC, 2013), agriculture ranks among the top three most hazardous occupational groups in terms of fatalities, injuries, and work-related illnesses.

Research conducted by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC, 2004) indicated that Trinidad has an aged farming population, with the majority of farmers more than 50 years old. Few young adults are opting to pursue a career in agriculture, and therefore older farmers will continue to be the backbone of this sector. Hence, placing more emphasis on OHS within the sector will not only ensure the well-being of farmers, and thus the sustainability of the sector, but will also have a long-term positive impact on the country's economy (Jugmohan, 2013).

The general pattern of food production is such that farmers are required to work in the open air on a daily basis all year round, often while performing repeated strenuous physical activities in uncomfortable working postures for extended periods of time (Pyykkönen and Aherin, 2012). In addition, agriculture is practiced in an unusual organizational context. That is, it lacks an organizational framework, such as personnel departments and hierarchies of management, which are needed for OHS management techniques to operate effectively. Combined with the fact that the symptoms of most occupational diseases do not become apparent until later in life, this situation makes it important to analyze the magnitude of OHS problems within Trinidad's agricultural sector.

No studies have been done in Trinidad or in the Caribbean to assess the prevailing situation. As such, many farmers are unaware of the potential risks that exist in their jobs. Further, there are no extension education programs addressing these issues. This first-time study in the agricultural sector explores the prevalence of OHS disorders and discomforts among vegetable farmers in Trinidad. The findings may have implications for extension programs and policy formulation.

## Occupational Health and Safety Hazards in Agriculture

Several hazards exist for farmers, which are attributed to exposure to agrochemicals, poor ergonomics, psychosocial stresses, and poor physical working conditions (White and Cessna, 1989).

### Chemical Hazards

Chemical use has become an essential part of modern farming systems, exposing farmers to agrochemicals through direct contact, residual contact from treated crops or equipment, and the drift of agrochemicals into untreated areas (Strong et al., 2008). Research conducted among U.S. farmers has shown that the effects of pesticide exposure on human health can be both immediate (coma, disorientation, headaches, vomiting and nausea, rashes, respiratory failure, and shock) and long-term, such as reproductive and neurological problems and cancer (Arcury et al., 2002; Das et al., 2001; ILO, 1986). Further, the lack of personal washing facilities on the farm results in farmers taking their contaminated clothes home, exposing their families to agrochemicals (Quandt et al., 2010).

### Ergonomic Hazards

Ergonomically poor working conditions or heavy physical workloads can result in injuries and musculoskeletal disorders (Giuffrida et al., 2001). In Ireland, researchers found

that back, neck, and shoulder pain were most common (Osborne et al., 2012). Similarly in the U.S., studies have indicated that farmers experience high rates of low back, shoulder, and upper extremity disorders (Davis and Kotowski, 2007), in addition to hand-arm vibration syndrome and osteoarthritis of the knee and hip (Walker-Bone and Palmer, 2002). Although musculoskeletal injuries are not as lethal as those caused by chemical exposure, they can still result in severe disabilities (Kirkhorn et al., 2010).

**Physical Hazards**

Physical hazards such as noise, vibration, heat, and other unhealthy microclimatic conditions can also have adverse effects on the health of farmers (Giuffrida et al., 2001). In the Caribbean, farmers are exposed to high daytime temperatures and are therefore at higher risk of heat exhaustion. For example, Delgado Cortez (2009) reported that farmers in Nicaragua were exposed to excessive heat and sunlight every day from approximately 6:00 a.m. to 3:00 p.m. during the sugarcane harvest period and were therefore at high risk for heat-related illnesses.

**Psychosocial Hazards**

Farmers are subjected to psychosocial hazards, such as occupational stress and depression. According to Ramesh and Madhavi (2009), who investigated occupational stress among farmers in India, farming ranks among the occupations that cause high levels of stress since farmers and their families work under the most stressful conditions. This stress can be attributed to financial problems, time pressures, diseases or pests, government policies, unpredictable weather conditions, and work overload.

**Slip, Trip, and Fall Hazards**

Slips, trips, and falls on farms have been identified as the leading causes of work-related injuries among farmers (ACC, 2002). Slips, trips, and falls occur mainly as a result of the presence of wet, slippery, and muddy surfaces. In a study conducted in the Swedish agricultural industry, it was found that injuries such as cuts, broken bones, and dislocations can arise from slips, trips, and falls (Lundqvist and Svennefelt, 2012). Some injuries may result in permanent disability and can even be fatal.

## Health and Safety within Trinidad's Agricultural Sector

In developing countries, farmers involved in the production of crops on a daily basis are at higher risk for a variety of occupational injuries and diseases than those in developed countries. While field preparation is often done mechanically, using a system in which several farmers' fields are prepared in succession when the fields are contiguous, most other tasks are still performed manually. Weeding, fertilizing, irrigation (although less labor-intensive methods are being rapidly adopted), and harvesting are all done manually. Further, self-employed farmers are not covered by insurance or injury benefit programs and therefore have limited access to compensation resources.

In Trinidad, most farmers are self-employed, operating farms with the assistance of their families to produce crops for a local market. However, when the demand for labor is high, they tend to employ hired laborers; this is usually the case when specializing in cash crop vegetable production. If farmers are not aware of health and safety practices, it is expected that the hired help constitute an additional risk category, making these issues even more important. Moreover, farmers and farmworkers have no special access to in-

formation on health and safety issues. Like the rest of the population, they are informed only on issues of national public health importance.

Because of these prevailing issues, the objective of this study was to assess the extent of health and safety disorders and discomforts among vegetable farmers in Trinidad, West Indies, and to relate these problems to personal and farm-related characteristics.

# Methodology

### Population and Sample Selection

There are approximately 20,000, mostly small farms in Trinidad, with an average land area of one-half hectare and producing mainly short-term vegetable crops for local markets. The livestock subsector is much smaller. These vegetable farms are dispersed all over the country. However, there are concentrated areas of production where the soil is very fertile. The target population for this study was small-scale commercial-oriented vegetable farmers ($n$ = 100) working on farms in ten of the most populated agricultural areas in north Trinidad: Aranguez ($n$ = 10), Mt. Lambert ($n$ = 10), Macoya ($n$ = 10), Maloney ($n$ = 10), Bon Air ($n$ = 10), Arima ($n$ = 10), Wallerfield ($n$ = 10), Aripo ($n$ = 10), Heights of Guanapo ($n$ = 10), and Valencia ($n$ = 10). This study employed a convenience sampling strategy to recruit its participants. In each area, the first farmer met was interviewed, followed by every third farmer working in the field at the time of data collection until ten farmers were successfully interviewed.

### Instrumentation

The questionnaire included two sections: (1) demographics and job information, and (2) prevalence of occupational disorders and discomforts among farmers. Section 1 consisted of closed-end questions that sought to gather information regarding farm location, farmers' age, gender, job role, level of education, number of years farming, the types of farming activities the farmers performed, and how often the farmers were visited by extension officers. Section 2 consisted of 24 closed-end questions and was divided into the following subsections according to types of occupational disorders and discomforts: musculoskeletal disorders (six questions), chemical-related discomforts (six questions), heat-related discomforts (five questions), psychosocial disorders (three questions), and slip/trip/fall incidents (four questions).

### Coding and Data Analysis

The data obtained from the questionnaires were numerically coded and statistically analyzed using SPSS (ver. 16, SPSS, Chicago, Ill.). The results for section 1 (demographics and job information) were reported as frequencies. Assessment of the prevalence of occupational disorders and discomforts among the sample population was determined for each subsection (musculoskeletal disorders, chemical-related discomforts, heat-related discomforts, psychosocial disorders, and slip/trip/fall incidents) by combining the scores of each question within the subsection to obtain the total scores.

For each subsection of occupational disorders and discomforts, the scores obtained were normalized to a possible range of 0 to 20. Using the normalized values, the results (levels of prevalence) were reported based on frequencies. Additionally, one-way ANOVA with the associated post hoc test (Tukey's b) was used to examine significant differences among means for each subsection of occupational injuries and diseases. The independent variables were age, gender, job role, type of farming activity, whether or not

farmers were visited by extension officers, and the frequency of visits by extension officers. The dependent variables were musculoskeletal disorders, chemical-related discomforts, heat-related discomforts, psychosocial disorders, and slip/trip/fall incidents.

# Results

## Characteristics of Farmers

A descriptive analysis of the sample showed that the majority of farmers were male (82%), and 18% were females. With regard to the farmers' ages, 32% were 46-60 years old, 31% were 31-45 years old, 19% were older than 61 years, and 18% were 18-30 years old. Most farmers (58%) had completed secondary education, 35% had completed primary education, 4% possessed a technical or vocational certificate, 2% had completed tertiary education, and 1% had no formal education. Most respondents (65%) were farm owners, while 28% were hired laborers, and the remaining 7% were family workers. A large portion of the sample (47%) had more than 15 years of farming experience, 28% had 1-5 years of experience, 16% had 10-15 years of experience, and 9% had 5-10 years of experience. Most farmers (82%) were mainly involved in land preparation and planting activities, while 72% were mainly involved in chemical application and harvesting activities. Fewer farmers reported watering (35%) and transporting (23%) as their main activities. Moreover, the majority of the farmers (72%) did not reside on the farm premises. In terms of hours worked per day on the farm, the majority of farmers (48%) worked 6-8 hours per day, while 35% worked 4-6 hours per day, 13% worked 2-4 hours per day, and the minority (4%) worked 1-2 hours per day. Finally, with regard to extension visits, 68% reported that they were visited by extension officers, of which 39% reported monthly visits, 16% reported annual visits, 7% were visited irregularly, and 6% were visited weekly.

## Prevalence of Occupational Disorders and Discomforts

### *Musculoskeletal Disorders*

Of the farmers surveyed, 61% reported experiencing muscle pain or discomfort in one or more of the following body regions within the previous year: 55% experienced lower back pains, 26% experienced upper back pains, 16% experienced pains in the shoulder, 15% experienced neck pains, 7% experienced ankle/foot pains, 6% experienced pains in the thigh/knee/legs, 4% experienced hand/wrist pains, and 2% experienced pains in the elbow/forearm (table 1). Overall, there was a moderate prevalence of musculoskeletal disorders for 55% of the sample, a low prevalence for 42%, and a high prevalence for 3% (table 1).

### *Chemical-Related Discomforts*

Of the farmers surveyed, 77% reported that they were exposed to agrochemicals within the past year and experienced one or more of the following discomforts: 19% experienced watery/burning eyes, 17% experienced skin rashes/itching, 6% experienced dizziness, 2% experienced vomiting, and 2% experienced headaches (table 1). Overall, there was a low prevalence of chemical-related discomforts for 67% of the sample, a moderate prevalence for 30% of the sample, and a high prevalence for 3% of the sample (table 1).

**Table 1. Prevalence of occupational disorders and discomforts.**

| Variable | | Category | Frequency (%) |
|---|---|---|---|
| Musculoskeletal disorders (MSDs) | | Yes | 61 |
| | | No | 39 |
| | Area of pain/discomfort | Neck | 15 |
| | | Shoulder | 16 |
| | | Ankle/foot | 7 |
| | | Elbow/forearm | 2 |
| | | Hand/wrist | 4 |
| | | Upper back | 26 |
| | | Lower back | 55 |
| | | Thigh/knee/leg | 6 |
| | MSD prevalence | Low (0-5) | 42 |
| | | Moderate (6-15) | 55 |
| | | High (16-20) | 3 |
| Chemical use/exposure | | Yes | 77 |
| | | No | 23 |
| | Chemical-related discomforts (CRDs) | Skin rashes/itching | 17 |
| | | Watery/burning eyes | 19 |
| | | Headaches | 2 |
| | | Dizziness | 6 |
| | | Vomiting | 2 |
| | CRD prevalence | Low (0-5) | 67 |
| | | Moderate (6-15) | 30 |
| | | High (16-20) | 3 |
| Heat-related discomforts (HRDs) | | Sunburns | 5 |
| | | Muscle cramps | 3 |
| | | Headaches | 34 |
| | | Dizziness | 2 |
| | | Fatigue | 25 |
| | | Fainting | 1 |
| | | Dehydration | 25 |
| | HRD prevalence | Low (0-5) | 46 |
| | | Moderate (6-15) | 37 |
| | | High (16-20) | 17 |
| Psychosocial disorders (PSDs) | | Stress | 31 |
| | | Depression | 2 |
| | | Intimidation | 9 |
| | | Working alone | 4 |
| | | Verbal abuse | 8 |
| | PSD prevalence | Low (0-5) | 62 |
| | | Moderate (6-15) | 33 |
| | | High (16-20) | 5 |
| Slip/trip/fall incidents (S/T/Fs) | | Slips | 49 |
| | | Trips | 6 |
| | | Falls | 33 |
| | S/T/F prevalence | Low (0-5) | 50 |
| | | Moderate (6-15) | 48 |
| | | High (16-20) | 2 |

| Variable | *N* | Mean (SD) | Minimum | Maximum | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| MSD prevalence | 100 | 7 (5.90) | 0 | 19 | -0.04 | 0.48 |
| CRD prevalence | 100 | 7 (4.23) | 0 | 19 | 1 | 0.24 |
| HRD prevalence | 100 | 7 (7.25) | 0 | 19 | 0.17 | -1.69 |
| PSD prevalence | 100 | 4 (5.76) | 0 | 19 | 1.10 | -0.10 |
| S/T/F prevalence | 100 | 6 (7.06) | 0 | 19 | 0.36 | -1.71 |

### *Heat-Related Discomforts*

The farmers reported experiencing one or more of the following discomforts while working in the sun within the last year: 34% experienced headaches, 25% experienced dehydration, 25% experienced fatigue, 5% experienced sunburns, 3% experienced muscle cramps, 2% experienced dizziness, and 1% experienced fainting (table 1). Overall, there was low prevalence of heat-related discomforts for 46% of the sample, a moderate prevalence for 37% of the sample, and a high prevalence for 17% of the sample (table 1).

### *Psychosocial Disorders*

The farmers reported experiencing one or more of the following problems within the last year: 31% experienced stress, 9% experienced intimidation, 8% experienced verbal abuse, 4% worked alone, and 2% experienced depression (table 1). Overall, there was a low prevalence of psychosocial disorders for 62% of the sample, a moderate prevalence for 33% of the sample, and a high prevalence for 5% of the sample (table 1).

### *Slip/Trip/Fall Incidents*

The farmers reported experiencing one or more of the following work-related injuries within the last year: 49% slipped while working on the farm, 33% fell while working, and 6% tripped while working (table 1). Overall, there was a low prevalence of slip/trip/fall incidents for 50% of the sample, a moderate prevalence for 48% of the sample, and a high prevalence for 2% of the sample (table 1).

## Relationships Between Disorders and Discomforts and Independent Variables

### *Musculoskeletal Disorders*

Individual ANOVA tests indicated that the mean prevalence of MSDs among farmers was significantly different based on age, job role, and farming activity, namely planting (table 2). With respect to age, there was a significant difference in the mean prevalence of MSDs. Tukey's b post hoc test indicated that there was a significantly higher prevalence of MSDs among farmers 31-45 years old, farmers 46-60 years old, and farmers older than 61 years than among farmers 18-30 years old.

Results also suggested that there was a significant difference in the mean prevalence of MSDs based on farmers' job roles. Tukey's b post hoc test indicated that there was a significantly higher prevalence of MSDs among family workers than among farm owners and hired laborers.

With respect to the farming activity planting, results suggested that there was a significant difference in the mean prevalence of MSDs. Tukey's b post hoc test confirmed that

**Table 2. ANOVA results for relationships with prevalence of musculoskeletal disorders ($FM_I$).[a]**

| Factor | Level | Mean (SD) | F | Tukey's b |
|---|---|---|---|---|
| Age | 18-30 | 4.6 (1.3) | 2.8** | a |
| | 31-45 | 7.9 (1.0) | | b |
| | 46-60 | 5.7 (1.0) | | b |
| | >61 | 9.1 (1.3) | | b |
| Job | Owner | 6.4 (0.7) | 4.6** | a |
| | Hired | 6.3 (1.1) | | a |
| | Family | 13.7 (2.3) | | b |
| Activity on farm: Planting | Yes | 7.3 (0.6) | 3.7*** | a |
| | No | 4.4 (1.3) | | b |

[a] Asterisks indicate significance: *p < 0.01, **p < 0.05, and ***p < 0.10. Not significant: gender and activities on farm: land preparation, watering, chemical application, harvesting, and transporting.

there was a significantly higher prevalence of MSDs among farmers who were involved in planting than among farmers who were not involved in planting.

### *Chemical-Related Discomforts*

Individual ANOVA tests indicated that the mean prevalence of chemical-related discomforts among farmers was significantly different based on age and farming activity, namely chemical application (table 3). With respect to age, there was a significant difference in the mean prevalence of chemical-related discomforts. Tukey's b post hoc test indicated that there was a significantly higher prevalence of chemical-related discomforts among farmers 31-45 years old, farmers 46-60 years of old, and farmers older than 61 years than among farmers 18-30 years old.

Results also suggested that there was a significant difference in the mean prevalence of chemical-related discomforts based on whether or not farmers performed chemical application activities. Tukey's b post hoc test confirmed that there was a significantly higher prevalence of chemical-related discomforts among farmers who performed chemical application activities than among farmers who did not perform these activities.

### *Heat-Related Discomforts*

Individual ANOVA tests indicated that the mean prevalence of heat-related discomforts among farmers was significantly different based on age, job role, and farming activity, namely harvesting (table 4). With respect to age, there was a significant difference in the mean prevalence of heat-related discomforts. Tukey's b post hoc test indicated that there was a significantly higher prevalence of heat-related discomforts among farmers 18-30 years old than among farmers 31-45 years old, farmers 46-60 years old, and farmers older than 61 years.

Results also suggested that there was a significant difference in the mean prevalence of heat-related discomforts based on farmers' job roles. Tukey's b post hoc test indicated

**Table 3. ANOVA results for relationships with prevalence of chemical-related discomforts ($FC_I$).[a]**

| Factor | Level | Mean (SD) | F | Tukey's b |
|---|---|---|---|---|
| Age | 18-30 | 4.2 (0.9) | 3.2** | a |
| | 31-45 | 6.7 (0.7) | | b |
| | 46-60 | 7.8 (0.7) | | b |
| | >61 | 7.5 (0.9) | | b |
| Activity on farm: Chemical application | Yes | 7.4 (0.4) | 6.5** | a |
| | No | 5.1 (0.7) | | b |

[a] Asterisks indicate significance: *p < 0.01, **p < 0.05, and ***p < 0.10. Not significant: gender, job, and activities on farm: land preparation, planting, watering, harvesting, and transporting.

**Table 4. ANOVA results for relationships with prevalence of heat-related discomforts ($FH_I$).[a]**

| Factor | Level | Mean (SD) | F | Tukey's b |
|---|---|---|---|---|
| Age | 18-30 | 12.1 (1.6) | 4.7* | a |
| | 31-45 | 7.9 (1.2) | | b |
| | 46-60 | 4.8 (1.2) | | b |
| | >61 | 6.1 (1.5) | | b |
| Job | Owner | 4.6 (0.7) | 17.8* | a |
| | Hired | 12.3 (1.1) | | b |
| | Family | 13.3 (2.5) | | b |
| Activity on farm: Harvesting | Yes | 10.1 (1.3) | 6.1** | a |
| | No | 6.2 (0.8) | | b |

[a] Asterisks indicate significance: *p < 0.01, **p < 0.05, and ***p < 0.10. Not significant: gender and activities on farm: land preparation, planting, watering, chemical application, and transporting.

that there was a significantly higher prevalence of heat-related discomforts among hired laborers and family workers than among farm owners.

With respect to the farming activity harvesting, there was a significant difference in the mean prevalence of heat-related discomforts. Tukey's b post hoc test confirmed that there was a significantly higher prevalence of heat-related discomforts among farmers who were involved in harvesting activities than among farmers who were not involved in harvesting activities.

### *Psychosocial Disorders*

Individual ANOVA tests indicated that the mean prevalence of psychosocial disorders among farmers was significantly different based on age, job role, and farming activities, namely planting, harvesting, and transporting (table 5). With respect to age, there was a significant difference in the mean prevalence of psychosocial disorders. Tukey's b post hoc test indicated that there was a significantly higher prevalence of psychosocial disorders among farmers 18-30 and 31-45 years old than among farmers 46-60 years old and older than 61 years.

Results also suggested that there was a significant difference in the mean prevalence of psychosocial disorders based on farmers' job roles. Tukey's b post hoc test indicated that there was a significantly higher prevalence of psychosocial disorders among hired laborers and family workers than among farm owners.

With respect to farming activities, Tukey's b post hoc test confirmed a significantly higher prevalence of psychosocial disorders among farmers who were involved in planting than among farmers who were not involved in planting, a significantly higher prevalence of psychosocial disorders among farmers involved in crop harvesting than among farmers not involved in harvesting activities, and a significantly higher prevalence of psychosocial disorders among farmers who physically transported crops than among farmers who did not physically transport crops.

### *Slip, Trip, and Fall Incidents*

Individual ANOVA tests indicated that the mean prevalence of slip, trip, and fall incidents (S/T/Fs) among farmers was significantly different based on age, job role, and farming activities, namely land preparation, planting, chemical application, harvesting, and transporting (table 6). With respect to age, there was a significant difference in the

**Table 5. ANOVA results for relationships with prevalence of psychosocial disorders ($FP_I$).**[a]

| Factor | | Level | Mean (SD) | F | Tukey's b |
|---|---|---|---|---|---|
| Age | | 18-30 | 5.9 (1.3) | 3.4** | a |
| | | 31-45 | 5.7 (1.0) | | a |
| | | 46-60 | 1.8 (0.9) | | b |
| | | >61 | 3.3 (1.2) | | b |
| Job | | Owner | 2.2 (0.6) | 11.5* | a |
| | | Hired | 7.6 (0.9) | | b |
| | | Family | 7.2 (2.1) | | b |
| Activities on farm: | Planting | Yes | 8.6 (1.2) | 15.5* | a |
| | | No | 3.0 (0.5) | | b |
| | Harvesting | Yes | 2.9 (0.6) | 11.7* | a |
| | | No | 7.0 (1.0) | | b |
| | Transporting | Yes | 7.5 (1.1) | 11.8* | a |
| | | No | 3.0 (0.6) | | b |

[a] Asterisks indicate significance: *p < 0.01, **p < 0.05, and ***p < 0.10. Not significant: gender and activities on farm: land preparation, watering, and chemical application.

**Table 6. ANOVA results for relationships with prevalence of slip, trip, and fall injuries ($FA_1$).[a]**

| Factor | | Level | Mean (SD) | F | Tukey's b |
|---|---|---|---|---|---|
| Age | | 18-30 | 2.3 (1.5) | 3.9** | a |
| | | 31-45 | 5.8 (1.3) | | b |
| | | 46-60 | 9.0 (1.2) | | b |
| | | >61 | 7.1 (1.5) | | b |
| Job | | Owner | 7.8 (0.8) | 4.7** | a |
| | | Hired | 3.1 (1.3) | | b |
| | | Family | 7.5 (2.8) | | a |
| Activities on farm: | Land preparation | Yes | 7.4 (0.7) | 9.4* | a |
| | | No | 2.0 (1.5) | | b |
| | Planting | Yes | 7.7 (0.7) | 15.9* | a |
| | | No | 0.8 (1.5) | | b |
| | Chemical application | Yes | 4.3 (1.3) | 3.6*** | a |
| | | No | 5.8 (1.3) | | b |
| | Harvesting | Yes | 8.1 (0.7) | 15.5* | a |
| | | No | 2.3 (1.2) | | b |
| | Transporting | Yes | 2.2 (1.4) | 12.2* | a |
| | | No | 7.7 (0.7) | | b |

[a] Asterisks indicate significance: *p < 0.01, **p < 0.05, and ***p < 0.10. Not significant: gender and activities on farm: watering.

mean prevalence of S/T/Fs. Tukey's b post hoc test indicated that that there was a significantly lower prevalence of S/T/Fs among farmers 18-30 years old than among farmers 31-45 years old, farmers 46-60 years old, and farmers older than 61 years.

Results also suggested that there was a significant difference in the mean prevalence of S/T/Fs based on farmers' job roles. Tukey's b post hoc test indicated that there was a significantly lower prevalence of S/T/Fs among hired laborers than among farm owners and family workers.

With respect to the farming activities, Tukey's b post hoc tests confirmed a significantly higher prevalence of S/T/Fs among farmers who were involved in land preparation activities than among farmers who were not involved in these activities, a significantly higher prevalence of S/T/Fs among farmers who were involved in crop planting activities than among farmers who were not involved in crop planting activities, a significantly higher prevalence of S/T/Fs among farmers who were not involved in chemical application activities than among farmers who were involved in chemical application activities, a significantly higher prevalence of S/T/Fs among farmers who were involved in crop harvesting activities than among farmers who were not involved in crop harvesting activities, and a significantly higher prevalence of S/T/Fs among farmers who did not physically transport crops than among farmers who physically transported crops.

# Discussion

The findings of this study indicated that the majority of farmers were middle-aged men with over 15 years of farming experience and that the following types of disorders and discomforts were most prevalent: MSDs of the lower back and upper body extremities, watery/burning eyes, skin rashes/itching, headaches, fatigue, dehydration, stress, and injuries attributed to slips and falls. Further, the prevalence of most occupational disorders and discomforts significantly differed with age, job role, and type of farming activity. However, gender did not significantly affect the prevalence of disorders and discom-

forts, suggesting that occupational disorders and discomforts affect both men and women in a similar manner.

This study indicated that while there was an overall moderate prevalence of MSDs among farmers, there was a higher prevalence of MSDs among older farmers than younger farmers, which may be attributed to the fact that older farmers have more years of experience farming and thus have been working in awkward postures and uncomfortable positions for a longer time. Additionally, there was a higher prevalence of MSDs among farmers who were involved in crop planting activities than among farmers who were not involved in these activities, arguably because most field work (such as planting) is done manually in repetitive stooping or squatting positions. Therefore, to reduce or prevent the prevalence of MSDs, it is recommended that, in addition to training, the methods and tools used by the farmers should be modified or redesigned.

The results also suggested that while there was an overall moderate prevalence of chemical-related discomforts among farmers, there was a higher prevalence of chemical-related discomforts among older farmers than younger farmers, arguably because older farmers have been using agrochemicals for a longer time and thus have had more exposure to agrochemicals. However, the prevalence of chemical-related discomforts among farmers did not significantly differ with job role because exposure to chemicals is not only direct (via chemical application) but also residual (from treated crops or equipment). Therefore, to reduce or prevent the health effects of the agrochemicals used, it is recommended that farmers be appropriately advised and encouraged to adopt organic farming practices or use non-toxic or less toxic agrochemicals (such as biopesticides). If these actions are not immediately feasible, farmers should be trained on the selection, use, and maintenance of appropriate personal protective equipment.

This study also found that while there was an overall moderate prevalence of heat-related discomforts among farmers, there was a higher prevalence of heat-related discomforts among younger farmers than older farmers. This may be due to the fact that the majority of younger farmers were most likely hired laborers or family workers who had to work in the sun for longer hours per day, as opposed to the older farmers (most likely farm owners) who tend to avoid working in the sun by beginning their work day at 4:00 a.m. and ending by 9:00 a.m., and in some instances returning to work in the late afternoon when the weather is cooler. Therefore, to reduce or prevent heat-related discomforts, such as heat exhaustion, it is recommended that all farm workers be trained and encouraged to: (1) take short frequent breaks in cool areas, (2) consume water frequently throughout the day, and (3) wear loose, breathable clothing whenever possible, including appropriate headwear (such as hats). Further, the relevant authorities can develop and implement a heat-illness prevention program.

The findings also showed that while there was an overall low prevalence of psychosocial disorders among farmers, there was a higher prevalence of psychosocial disorders among younger farmers than older farmers, which may be explained by the fact that the majority of younger farmers are most likely hired laborers and family workers, who are required to work for longer hours, usually in undesirable conditions. This, combined with the absence of any financial compensation available to farmers, for instance in the event of flooding, may arguably result in high levels of stress. Therefore, it is recommended that the public and private sectors collaborate to devise and implement measures that can ease the psychological pressures on farmers. For instance, an insurance scheme that is specifically beneficial to vegetable farmers could be a first step.

The results also indicated that there was a moderate prevalence of incidents attributed to slips, trips, and falls among farmers. Due to Trinidad's climate, most slips and falls occur as a result of rainy weather conditions, which cause the ground to become muddy and slippery. Additionally, trauma caused by slips, trips, and falls can result in MSDs, such as sprains, strains, and dislocations. There was a higher prevalence of slips, trips, and falls among older farmers than younger farmers, which may be attributed to complacency from many years of farming. That is, older farmers may be more negligent, thereby increasing their risk. Additionally, it can be argued that older farmers may have diminished muscular strength in their legs, which would increase their risk of slips, trips, and falls. There was also a higher prevalence of slips, trips, and falls among farm owners and family workers than among hired workers, arguably because hired workers are more cautious when working on slippery surfaces, as they know that there are no injury benefits if an accident occurs. Therefore, to reduce or prevent slips, trips, and falls, it is recommended that farmers be advised to: (1) wear appropriate personal protective equipment, such as skid-resistant boots, (2) make changes to the work environment, such as increasing the width of the walkways on either side of the crop beds, and (3) be more conscious or deliberate in their movements, especially in the rainy season.

## Conclusion and the Implications for Extension

This study concluded that there is a moderate prevalence of occupational disorders and discomforts among vegetable farmers in Trinidad. Since agriculture plays an essential role in the cultural, political, and economic development of Trinidad, there is much need for improving the state of occupational safety and health in Trinidad's agricultural sector. Failure to do so would put food security and agricultural sustainability goals at risk. Furthermore, failure to take action in the specified areas will not only negatively impact the well-being of farmers but also the well-being of the citizens of Trinidad. Moreover, since the pattern of vegetable farming and the age profile of farmers are similar in the Caribbean, other decision makers in the region need to pay attention to these findings and plan appropriate interventions to safeguard their farmers and the agricultural sector.

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